ied by admirable figures, Depéret points out that *Eohippus* Marsh from our Wasatch (p. 222) is closely similar to *Hyracotherium* Owen and to *Pachynolophus* Lemoine from the Suessonian; that *Protorohippus* Wortman from our Wind River is closely similar to *Propalæotherium* Gervais and *Pachynolophus* Pomel; that *Epihippus* and *Eohippus* Marsh are similar to *Lophiotherium* Gervais. It is probably premature to attempt to establish generic identity between these American and European forms; but it is evident that the time is not far distant when such identity is likely to be established, unless we take the ground that the European and American forms were entirely independent in their evolution from the time of their first appearance.

THE PALEONTOLOGICAL LITERATURE OF 1898 AND 1899.

Dr. Max Schlosser, of Munich, again places us in his debt by the continuation of his valuable résumé of the literature upon fossil and recent mammals.* This annual review began in 1884. The present section fills nearly one hundred pages of fine type, and the works reviewed are divided under three heads: (1) Those properly pertaining to Pleistocene anthropology and mammalian remains found with man; (2) the Tertiary and Mesozoic mammals; (3) the distribution and taxonomy of recent mammals. In the exhaustive library of the University of Munich, Dr. Schlosser finds practically the literature of the world, and in this review he gives a brief abstract of all that was published during the years 1898 and 1899. It is the author's custom to fairly present in abstract the works reviewed, including very brief critical remarks of his own. These digests are clear, and remarkably free from prejudice. They are simply priceless for every worker in mammalian paleontology and anthropology, and our thanks to Dr. Schlosser cannot be too heartily expressed.

H. F. O.

* 'Literaturbericht für Zoologie in Beziehung zur Anthropologie,' p. 115, für das Jahr 1898, p. 165 für das Jahr 1899.

SOME SINGULAR NICKEL-STEEL ALLOYS.

Through the courtesy of M. Ch.-Ed. Guillaume, Directeur-adjoint du Bureau international des poids et mesures, Paris, there has come to hand a very interesting collection of documents* relating to a curious variety of nickel-steel alloys, regarding which little seems to have been published on this side the Atlantic, and the only notice of which, according to the inventor, has been in the form of a denial of the possibility of their existence.

M. Guillaume has discovered, has produced in quantity and has brought into use in the industries, an alloy of steel or iron and nickel which he denominates 'non-dilatable'; it remains of substantially constant dimensions with ordinarily varying temperatures. This peculiarity, as he says, is allied to a general anomaly attributable to alloys of this class capable of forming solid solutions which are in certain cases unstable. Forthcoming publications in the French technical and scientific journals are expected to give later information regarding this curious series of alloys which are expected to have important applications in the arts. They are already in use in horological work and the pendulum of constant length may now be had. Instruments of precision, and particularly measuring apparatus for geodetic and other fine work, may be thus constructed.

These alloys are actually produced commercially, at Imphy, by the Société de Commentry-Fourchambault. They are now coming into use for many purposes in Europe, and should be better known in this country. The surveyor's tape, the measuring rod for

* 'Recherches sur les aciers au nickel,' Société d'Encouragement; Paris, 1898; 'Sur les variations temporaires et résiduelles des aciers au nickel réversibles,' *Comptes rendus*, i., CXXIV., 1897; 'Das Leben der Matérie,' *Physikalische Zeitschrift*, 2, 1899; 'Les déformations passagères des solides,' Cong. Int. de physique, 1900; 'Les aciers au nickel,' *ibidem*, 1900; 'Le pendule en acier au nickel,' *Journal Suisse d'horlogerie*, 1902; 'Magnetostriction des aciers-nickel,' *Journal de physique*, 1902; 'La convention du mètre et le Bureau international des poids et mesures,' *Bull. de la Soc. d'Encouragement*, 1902.

geodetic work* and the pendulum are among the first applications to find recognition, but the expectation of M. Guillaume is that it will prove possible to adapt other nickel-steel alloys for substitution for the filament of the common 'incandescent' lamp, a work in fact already in progress.

M. L. Dumas, in his 'Les aciers au nickel à haute teneur'† describes the mechanical properties of above one hundred and fifty of the alloys of these metals. At least one Paris firm, Radiguet et Massiot, on the rue Château-d'eau, has undertaken the marketing of these alloys.

These new discoveries and their outcome may not have as impressive aspects as those which have given us nickel-steel armor-plate or gun-barrels; they perhaps have more real importance to the world. The supply of nickel ores seems likely to prove ample for the immediate future, at least, and scientific men and engineers will be hopeful of still other and useful products in this field. Meantime, M. Guillaume deserves great credit and large returns for his part in the work of exploitation. R. H. THURSTON.

RADIUM.

SIR WILLIAM CROOKS has written to the London *Times* the following letter:

In the presence of a mystery like that of radium any reasonable attempt at explanation will be welcome, so I will ask your permission to revive a hypothesis I ventured to submit to the British Association in my presidential address in 1898. Speaking of the radio-active bodies then just discovered by M. and Mme. Curie, I drew attention to the large amount of energy locked up in the molecular motions of quiescent air at ordinary pressure and temperature, which, according to some calculations by Dr. Johnstone Stoney, amounts to about 140,000 foot pounds in each cubic yard of air; and I conjectured that radio-active bodies of high atomic weight might draw upon this store of energy in somewhat the same manner as Maxwell imagined when he invented his celebrated 'demons' to explain a similar problem. I said it was not difficult so to modify this hypothesis as to reduce it to the level of an inflexible law, and thus bring it within the ken of a philosopher in search of a new tool. I suggested that the atomic structure of radio-active bodies was such as to enable them to throw off the slow-moving molecules of the air with little exchange of energy, while the quick-moving missiles would be arrested, with their energy reduced and that of the target correspondingly increased. (A similar sifting of the swift-moving molecules is common enough, and is effected by liquids whenever they evaporate into free air.) The energy thus gained by the radio-active body would raise its temperature, while the surrounding air would get cooler. I suggested that the energy thus gained by the radio-active body was employed partly in dissociating some of the gaseous molecules (or in inducing some other condition which would have the effect of rendering the neighboring air a conductor of electricity) and partly in originating undulations through the ether, which, as they take their rise in phenomena so disconnected as the impacts of molecules, must furnish a large contingent of Stokesian pulses of short wave-length. The shortness in the case of these waves appears to approach, without attaining, the extreme shortness of ordinary Röntgen rays.

Although the fact of emission of heat by radium is in itself sufficiently remarkable, this heat is probably only a small portion of the energy radium is constantly sending into space. It is at the same time hurling off material particles which reveal their impact on a screen by luminous scintillations. Stop these by a glass or mica screen and torrents of Röntgen rays still pour out from a few milligrams of radium salt, in quantity to exhibit to a company all the phenomena of Röntgen rays, and with energy enough to produce a nasty blister on the flesh, if kept near it for an hour.

In conclusion, if it is not too much trespassing on your space, I should like to express the great admiration which I have, in com-

* The recent measurement of the meridional arc on Spitzbergen was effected with this alloy in the measuring wires.

† Published by Dunod, Paris, 1900.